Three-Day DfAM Course Outline

Hands-on exercises Presentations/discussions

Day 1		
8:30-8:45	Introduction	Introduction to the course and attendees.
8:45-9:30	State of the AM industry	Recent AM growth trends and developments around the world.
9:30-10:15	Introduction to design for AM	Benefits of AM in the context of DfAM, how AM is being applied, and how certain parts can be designed for AM.
10:15-10:45	Break	
10:45-11:30	AM process: from CAD to part	Examining the complete AM process chain, from CAD part creation to part production. Attendees gain an understanding of the entire process chain and how it helps them to design better AM parts. It includes file formats and working with STL manipulation software.
11:30-12:00	Thinking DfAM	The thought processes behind DfAM.
12:00-12:45	Lunch	
12:45-2:15	AM design optimization exercise	Optimize a part to be printed with minimal or no support material. In this exercise, participants design a hydraulic manifold while considering print orientation and support material.
2:15-2:45	Break	
2:45-3:00	Laser scanning	The use of laser scanning, CT, and other methods.
3:00-4:00	Design for mass-customization exercise	Hands-on exercise to design a custom product using a combination of CAD, 3D scanning, and STL editing software. Attendees learn to work with multiple software tools to produce custom parts optimized for AM.
Day 2		
8:00-10:00	Designing for metal AM	Specific issues and guidelines around designing for metal AM, including anisotropy, process constraints, general guidelines related to wall thicknesses, hole sizes, tolerances, angles, etc. A close look at metal AM post-processing and material properties.
10:15-10:45	Break	
10:45-11:15	Lattice structure exercise	A solid part is transformed into a shell filled with a lattice structure.
11:15-12:00	Part consolidation exercise	Hands-on exercise on the implications of part consolidation for AM.
12:00-12:45	Lunch	

12:45-1:15	Economics of AM	When does it make sense, or not, to use AM for production quantities? What determines AM costs and how are parts designed to minimize cost?
1:15-2:00	Designing for polymer AM processes	Specific issues and design guidelines surrounding polymer AM (material extrusion, powder bed fusion, vat photopolymerization, etc.), including post-processing.
2:00-2:20	Break	
2:20-4:00	Topology optimization	Designing topology-optimized parts for AM and creating light-weight parts using software such as Inspire from solidThinking. The workflow of topology optimization, setting up multiple load-cases, and using the generated ideas to produce a final design.
Day 3		
8:00-9:30	Lab visit	Visit to local AM facility to remove student designed parts from machines and post-process them.
9:30-10:00	Tooling applications of AM	AM beyond direct part production: Tools for injection-molding, sheet-metal forming, cutting and drilling, extrusion, jigs and fixtures, etc. Adding fixtures to parts to ease mounting on CNC machines for more efficient post-processing.
10:00-10:30	Break	
10:30-12:00	Computational design	Intro to implicit modelling and design exercise on designing a heat exchanger in nTopology
12:00-12:45	Lunch	
12:45-1:45	DfAM expert panel session	A group of AM experts offer opinions and answer questions from participants.
1:45-2:15	Break	
2:15-3:15	AM in the future	Looking at where AM and design software tools are headed in the future and how they may impact DfAM.
3:15-3:45	Conclusion	Closing comments and distribution of certificates of completion.

DfAM
Design for Additive Manufacturing